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(54) **Chain tensioner**

(57) A chain tensioner has a support member 1 and a pressure applying member 4 mounted thereon. Biassing means 5 act to cause the support member to change position so as to increase tension on the chain if the chain tension slackens. Means 2, 9 prevent return movement of the support member when the chain tension increases. The pressure applying member 5 is moveable relative to the support member 1 in response to variations in tension in the chain and at least its movement towards the support member is damped. As shown the pressure applying member comprises a slipper head 4 biassed away from the support member by a V-shaped steel spring 6. A spacer 8 provided additional resilient damping.

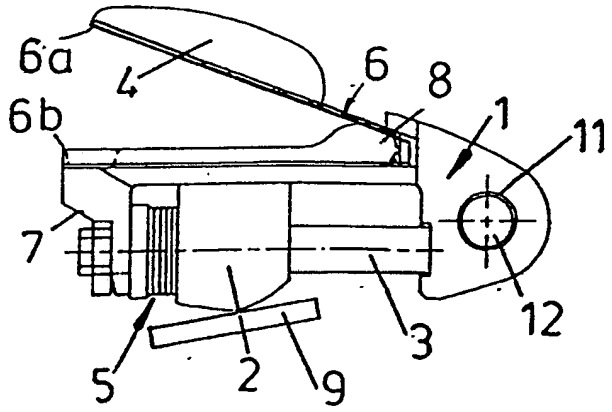

FIG 1

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1990.

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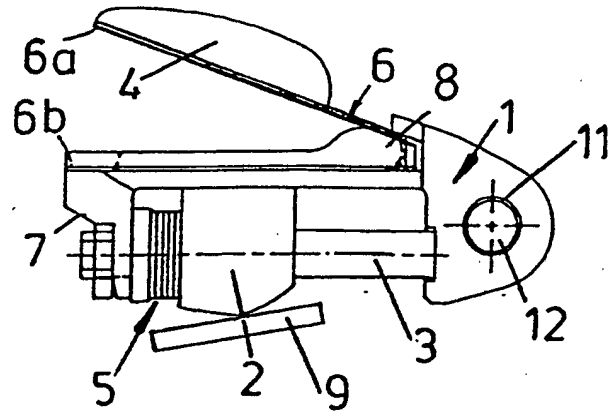

FIG 1

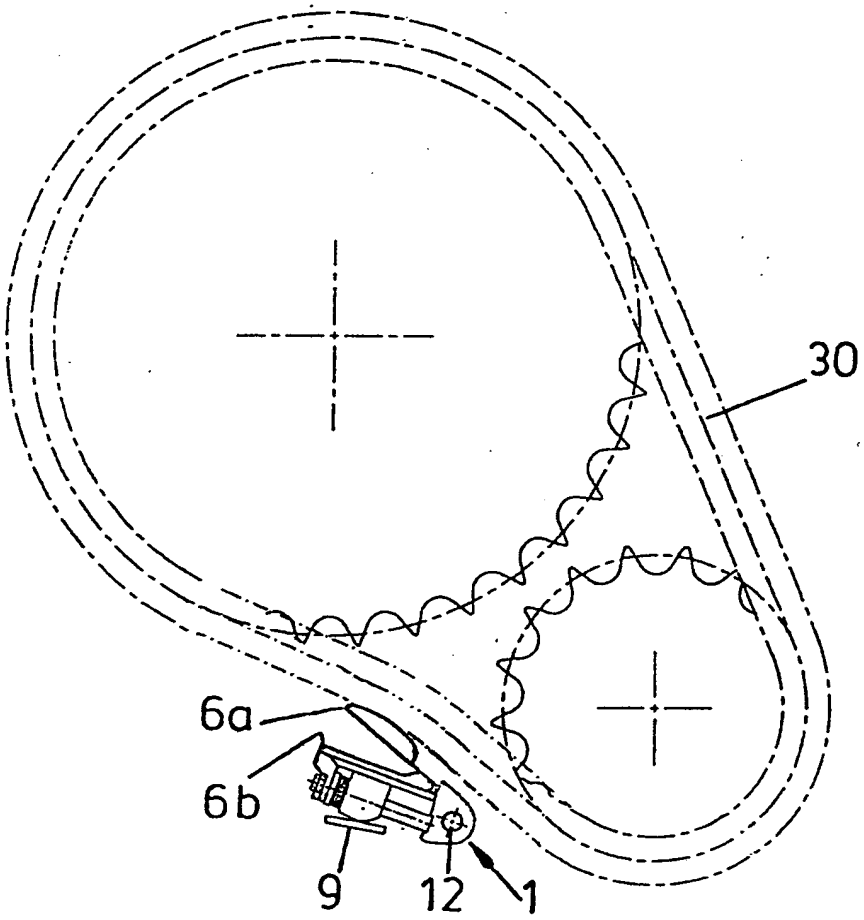

FIG. 3

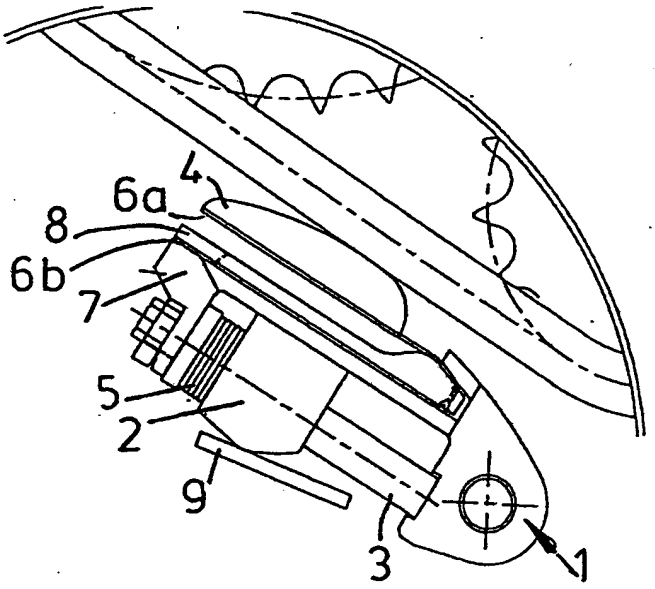

FIG. 2(a)

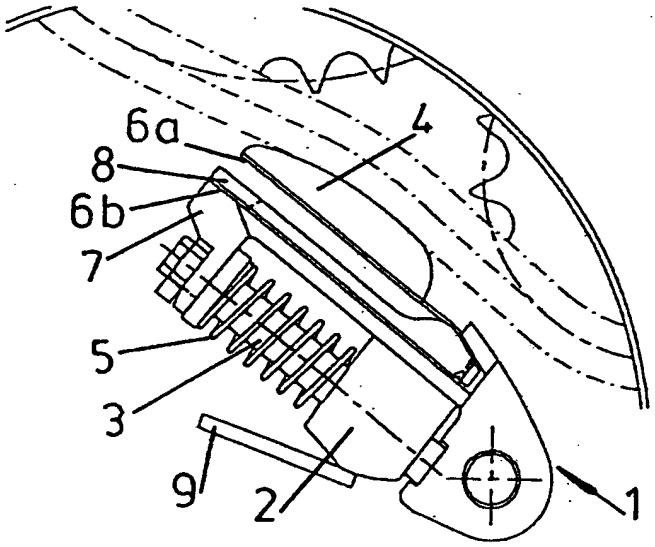

FIG. 2(b)

TENSIONER

The present invention relates to a tensioner for a chain, belt or similar driving element, referred to hereinafter for brevity as a chain.

Tensioners are employed to control vibrations in a chain mounted on a chain drive such as a cam shaft or accessory drive, in an attempt to prevent slippage or demounting of the chain, and to compensate for loss of tension in the chain as it becomes elongated and slack with wear. Such tensioners may be complex hydraulically operated devices but are preferably simple mechanical devices.

A known tensioner for keeping a chain in tension comprises a support member; a pressure applying member mounted thereon; biassing means acting to cause the support member to change position so as to increase tension on the chain if the chain tension slackens; and means preventing return movement of the support member when the chain tension increases.

Such known mechanical tensioners, though simple, suffer from a number of disadvantages.

In practice the load applied against the chain by the tensioner is not constant but decreases as the chain slackens further and the biassing means extends towards its maximum extended position. A n attempt has been made to deal with this problem by configuring the means preventing return movement of the support member when the chain tension increases so as to provide a varying resistance to return movement but this is impracticable in some situations where space considerations are important and adds to the complexity of the tensioner.

Conversely, to maintain a reasonable tension in a worn chain the initial pre-load applied to the chain by the tensioner is often undesirably high, increasing initial wear on the chain; or the tensioner has a low stiffness characteristic so that if there is even a small slackness in the chain due, for example, to a change in the speed of the drive, there is a correspondingly large and irreversible extension of the biassing means and consequent increase in pressure applied by the tensioner device, which is undesirable since a small

change in load may often be the result of the transient vibration of the chain rather than irreversible slackening.

Furthermore, the application of an initial high tension on the chain by the tensioner device increases undesirable chain gearing noise.

These characteristics render the mechanical tensioners easily usable only on drives which possess a flat torque characteristic or where a low stiffness characteristic is tolerable. Such tensioners cannot be effectively used on, for example, motor vehicle cam shaft drives where torques are very variable. In such situations more complex and larger mechanisms are required.

It is an object of the present invention to provide a simple and small tensioner which provides consistent behaviour throughout the length of the life of the chain and which combines a low load on the chain, resulting in reduced wear, with a high stiffness rating resulting in good chain vibration control and reduced maintenance requirements.

According to the present invention there is provided a tensioner for keeping a chain in tension comprising: a support member; a pressure applying member mounted thereon; biassing means acting to cause the support member to change position so as to increase tension on the chain if the chain tension slackens; and means preventing return movement of the support member when the chain tension increases; the pressure applying member being moveable relative to the support member in response to variations in tension in the chain and at least its movement towards the support member being damped.

There is thereby provided a tensioner giving a high stiffness characteristic, but damping vibrations of a certain amplitude, thereby reducing the incidence of irreversible increase of tension on the chain due to merely transient vibration-induced slackness.

Preferably the pressure applying member is biassed away from the support member.

Preferably the pressure applying member is biassed away from the support member by spring means.

Preferably the spring means comprise a substantially V shaped leaf spring but might be a torsion or other spring or a resilient pad.

Preferably there is located a resilient spacing member between the pressure applying member and the support member

Preferably the resilient spacing member acts also to retain the spring means in position.

The invention will now be described by way of example only and with reference to the accompanying drawings in which:

Figure 1 is a side elevation view of a tensioner device according to the present invention;

Figure 2a and Figure 2b are diagrammatic representations of the tensioner device in operation with (a) a new chain and (b) a chain after wear has taken place.

Figure 3 illustrates the tensioner in conjunction with the camshaft and drive chain of an internal combustion engine.

According to one embodiment of the invention, the tensioner device comprises an elongate mounting body 1 provided with a hollow pin 11 forming a pivot point 12 to enable the mounting body 1 to be mounted onto a support (not shown) such as an engine block adjacent the chain 30 to be tensioned.

A spindle 3 is received at one of its ends in the mounting body 1 and secured to the mounting body 1 at its other end by a retaining member 7 or other suitable means.

A wedge member 2 is mounted on and slidable along the axis of the spindle 3.

A helical coil compression spring 5 surrounds the spindle 3 and acts to urge the wedge member 2 away from the retaining member 7. The helical coil spring 5 could alternatively be a tension spring mounted at the other end of the mounting body 1 and drawing to the wedge member 2 towards it.

A guide plate 9 is mounted on a support bracket (not show) such as an engine block or mounting and so positioned and angled relative to the wedge member 2 so as to define a path along which the wedge member 2 is slidable under bias from the helical coil spring 5 along the spindle 3. The guide plate 9 complements the profile of the wedge member 2 in contact with it so as to prevent any return travel along the spindle 3.

A slipper head 4 is mounted on one limb 6a of a substantially V shaped steel spring blade 6 whose other limb 6b is mounted on the mounting body 1 adjacent the pivot point 11 and adjacent the retaining member 7.

The slipper head 4 may be of plastic, rubber or other suitable material and may be changeable to accommodate different types of chain.

The steel spring blade 6 is prestressed to a desired degree into an open position and is provided with a spacer 8 separating the two limbs 6a, 6b to provide additional resilient damping and which may also act to retain the steel spring blade 6 in position on the mounting body 1.

The spacer 8 may be of varying configurations depending on the degree of damping required. Other suitable materials might be used to achieve the damping effect of the steel spring 6 such as a torsion spring, rubber pad or other resilient member enabling movement of the slipper head 4 relative to the mounting support 1.

In use, the tensioner is mounted in a position wherein the wedge member 2 is in its initial operating position for a new, unworn chain, with the biassing spring 5 compressed, the wedge member 2 being positioned against the guide plate 9 and the slipper head 4 urged against the chain 30 to be tensioned.

If the chain becomes only to a small degree more slack due for example to a short term change in speed of its drive, the resistance of the chain 30 to the pressure applied by the slipper head 4 slackens and the compression of the steel spring blade 6 decreases, only to increase again when the change of speed stops or is reversed. This often short term small movement is not transmitted to the biassing spring 5 and so no movement of the wedge member 2 takes place.

Only when the chain 30 slackens beyond a certain predetermined degree does the damping effect cease to operate and the biassing spring 5 then acts to increase the pressure applied by the slipper head 4 on the chain 30 until a new balance is achieved between the opposing forces of the chain 30 and the biassing spring 5.

In this way periodic vibration arising out of changes in torque exerted on the chain, for example, through changes in engine speed, are damped by the steel spring blade 6 eliminating unnecessary expansion of the spring 1 with consequential savings on load and wear on the chain.

There is thereby provided through a simple mechanical tensioner an effectively stepless progression in the load applied to the chain by

the tensioner which corresponds to the actual progression of wear on the chain and damps rather than stops vibrations which would otherwise lead to undesired increase in tension of the chain.

The tensioner provides a more constant tension throughout the length of the life of the chain and combines a low load on the chain, resulting in reduced wear and noise, with a high stiffness rating resulting in good chain vibration control.

CLAIMS

1. A tensioner for keeping a chain in tension comprising: a support member; a pressure applying member mounted thereon; biassing means acting to cause the support member to change position so as to increase tension on the chain if the chain tension slackens; and means preventing return movement of the support member when the chain tension increases; the pressure applying member being moveable relative to the support member in response to variations in tension in the chain and at least its movement towards the support member being damped.

2. A tensioner as claimed in claim 1, wherein the pressure applying member is biassed away from the support member.

3. A tensioner as claimed in claim 2, wherein the pressure applying member is biassed away from the support member by spring means.

4. A tensioner as claimed in claim 3, wherein the spring means comprise a substantially V shaped leaf spring, a torsion or other spring, or a resilient pad.

5. A tensioner as claimed in any one of the preceding claims, wherein there is located a resilient spacing member between the pressure applying member and the support member.

6. A tensioner as claimed in claim 5, wherein the resilient spacing member acts also to retain the spring means in position.

7. A chain tensioner substantially as herein described, with reference to the accompanying drawings.

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Examiner's report to the Comptroller under Section 17 (The Search Report)

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Relevant Technical fields

(i) UK Cl (Edition K) F2Q

(ii) Int Cl (Edition 5) F16H

Search Examiner
A HABBIJAM

Databases (see over)

(i) UK Patent Office

(ii) ONLINE DATABASES: WPI

Date of Search
6 OCTOBER 1992

Documents considered relevant following a search in respect of claims 1-7

Category (see over)	Identity of document and relevant passages	Relevant to claim(s)
A	GB 1190366 (RENOLD LTD)	1

Category	Identity of document and relevant passages	Relevant to claim(s.

Categories of documents

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EUR-CL (EPC): F16H007/08

US-CL-CURRENT: 474/111

ABSTRACT:

CHG DATE=19990617 STATUS=O> A chain tensioner has a support member 1 and a pressure applying member 4 mounted thereon. Biassing means 5 act to cause the support member to change position so as to increase tension on the chain if the chain tension slackens. Means 2, 9 prevent return movement of the support member when the chain tension increases. The pressure applying member 5 is moveable relative to the support member 1 in response to variations in tension in the chain and at least its movement towards the support member is damped. As shown the pressure applying member comprises a slipper head 4 biassed away from the support member by a V-shaped steel **spring** 6. A spacer 8 provided additional resilient damping. <IMAGE>

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Abstract Text - FPAR (1):

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International Classification, Main - IPCO (1):
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